

WHAT IS CLAIMED IS:

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2       1. A module for dispensing material to a semiconductor processing  
3 tool, the module comprising:

4           a vessel including a first chamber and a second chamber, the vessel  
5 configured to receive the material from a bulk supply and to receive a pressurized flow  
6 of gas from a gas source; and

7           a valve assembly operable to selectively permit fluid communication  
8 between the first chamber and the second chamber during a non-refill module state and  
9 to prevent fluid communication between the first chamber and the second chamber  
10 during a refill module state.

1       2. The module of claim 1 wherein the second chamber is in fluid  
2 communication with the semiconductor fabrication tool and in fluid communication  
3 with a pressurized gas supply.

1       3. The module of claim 2 further comprising a pressure release  
2 valve in communication with the second chamber, the pressure release valve configured  
3 to automatically vent the second chamber when a pressure within the second chamber  
4 exceeds a cracking pressure.

1       4. The module of claim 2 further comprising:  
2           a processor;  
3           a pressure release valve in communication with the second chamber; and  
4           a pressure sensor positioned in the second chamber and in  
5 communication with the processor to activate the pressure release valve to vent the  
6 second chamber when a pressure within the second chamber exceeds a threshold value.

1       5. The module of claim 2 wherein:  
2           the first chamber includes a first port and a second port;  
3           the second chamber includes a first port and a second port, the first port  
4           in fluid communication with the semiconductor fabrication tool and the second port in  
5           fluid communication with the pressurized gas supply; and  
6           the valve assembly includes,

7 a first control valve positioned between the first port of the first chamber  
8 and the first port of the second chamber,

9 a second control valve positioned between the second port of the first  
10 chamber and the second port of the second chamber,

11 a material supply valve positioned between the first port of the first  
12 chamber and a bulk material supply,

13 a vent valve positioned between the second port of the first chamber and  
14 an outside environment;

15 such that in the non-refill module state the first and second control  
16 valves are open, the material supply valve is closed, and the vent valve is closed, and in  
17 the refill module state the first and second control valves are closed, the material supply  
18 valve is open, and the vent valve is open.

1 6. The module of claim 5 further comprising:

2 a dispense valve positioned between the second port of the second  
3 chamber and the semiconductor processing tool; and

4 a first fluid level sensor positioned in the second chamber and in  
5 electrical communication with the dispense valve, such that triggering of the first fluid  
6 level sensor automatically closes the dispense valve.

1 7. The module of claim 6 further comprising:

2 a processor; and

3 a second fluid level sensor positioned in the second chamber at a level  
4 above the first fluid level sensor, the second fluid level sensor in communication with  
5 the processor such that triggering the second fluid level sensor automatically initiates a  
6 change from the non-refill module state to the refill module state.

1 8. The module of claim 6 further comprising a first fluid level  
2 sensor positioned in the first chamber and in electrical communication with the material  
3 supply valve, such that triggering of the first fluid level sensor automatically closes the  
4 material supply valve.

1 9. The module of claim 8 further comprising:

2 a processor; and

3                   a second fluid level sensor positioned in the first chamber at a level  
4                   below the first fluid level sensor, the second fluid level sensor in communication with a  
5                   processor such that triggering of the second fluid level sensor initiates a change from  
6                   the refill module state to the non-refill module state.

1                   10.       The module of claim 2 wherein:  
2                   the first chamber includes a first port, a second port, and a third port;  
3                   the second chamber includes a first port, a second port, and a third port,  
4                   the first port in fluid communication with the semiconductor fabrication tool and the  
5                   second port in fluid communication with the pressurized gas supply; and  
6                   the valve assembly includes,  
7                   a first control valve positioned between the first port of the first chamber  
8                   and the first port of the second chamber,  
9                   a second control valve positioned between the third port of the first  
10                  chamber and the third port of the second chamber,  
11                  a material supply valve positioned between the second port of the first  
12                  chamber and a bulk material supply,  
13                  a vent valve positioned between the first port of the first chamber and an  
14                  outside environment;  
15                  such that in the non-refill module state the first and second control  
16                  valves are open, the material supply valve is closed, and the vent valve is closed, and in  
17                  the refill module state the first and second control valves are closed, the material supply  
18                  valve is open, and the vent valve is open

1                   11.       The module of claim 10 further comprising:  
2                   a dispense valve positioned between the second port of the second  
3                   chamber and the semiconductor processing tool; and  
4                   a first fluid level sensor positioned in the second chamber and in  
5                   electrical communication with the dispense valve, such that triggering of the first fluid  
6                   level sensor automatically closes the dispense valve.

1                   12.       The module of claim 11 further comprising:  
2                   a processor; and  
3                   a second fluid level sensor positioned in the second chamber at a  
4                   level above the first fluid level sensor, the second fluid level sensor in communication

5 with the processor such that triggering of the second fluid level sensor automatically  
6 initiates a change from the non-refill module state to the refill module state.

1 13. The module of claim 11 further comprising a first fluid level  
2 sensor positioned in the first chamber and in electrical communication with the material  
3 supply valve, such that triggering of the first fluid level sensor automatically closes the  
4 material supply valve.

1 14. The module of claim 13 further comprising:  
2       a processor; and  
3       a second fluid level sensor positioned in the first chamber at a  
4 level below the first fluid level sensor, the second fluid level sensor in communication  
5 with a processor such that triggering of the second fluid level sensor initiates a change  
6 from the refill module state to the non-refill module state.

1 15. A method of continuously dispensing a material to a  
2 semiconductor processing tool, the method comprising:  
3       supplying a pressurized flow of an inert gas to a first chamber of a vessel  
4 containing the material, such that the material in the first chamber flows out of the first  
5 chamber to the semiconductor processing tool;  
6       in a refill state, while dispensing the material to the semiconductor  
7 processing tool from the first chamber, venting a second chamber of the vessel and  
8 supplying the material to the second chamber from a bulk material supply; and  
9       in a non-refill state, sealing the second chamber from the environment  
10 and placing the second chamber in fluid communication with the first chamber, such  
11 that the material flows from the first chamber to the semiconductor processing tool.

1 16. The method of claim 15 wherein in the non-refill state the  
2 material is flowed in a path from the second chamber to the first chamber to the  
3 semiconductor processing tool.

1 17. The method of claim 15 wherein in the non-refill state the  
2 material is flowed in a path of at least one of from the second chamber to the  
3 semiconductor processing tool and from the second chamber to the first chamber to the  
4 semiconductor processing tool.

1                   18. The method of claim 15 wherein in a change between the non-  
2 refill state and the refill state is triggered by a drop in a fluid level in the second  
3 chamber.

1                   19. The method of claim 15 wherein a change between the non-refill  
2 state and the refill state is triggered by completion of processing of a predetermined  
3 number of wafers by the semiconductor processing tool.

1                   20. A module for dispensing material to a semiconductor processing  
2 tool, the module comprising:

3                   a vessel including a first chamber and a second chamber;  
4                   the first chamber including a first port and a second port, the first port  
5                   configured to receive the material from a bulk supply through a material supply  
6                   valve, and the second port in communication with an external environment  
7                   through a vent valve,

8                   the second chamber including a fluid level sensor, a first port, and a  
9                   second port, the first port of the second chamber in fluid communication with a  
10                  semiconductor processing tool through a dispense valve, the second port of the  
11                  second chamber configured to receive a pressurized flow of gas from a  
12                  pressurized gas supply through a gas inlet valve;

13                  a pressure release valve in communication with the second port of the  
14                  second chamber, the pressure release valve also in communication with the external  
15                  environment;

16                  a first control valve positioned between the first port of the first chamber  
17                  and the first port of the second chamber; and

18                  a second control valve positioned between the second port of the first  
19                  chamber and the second port of the second chamber,

20                  such that in the non-refill module state the first and second control valves  
21                  are open, the material supply valve is closed, and the vent valve is closed, and in the  
22                  refill module state the first and second control valves are closed, the material supply  
23                  valve is open, and the vent valve is open, and transition between the non-refill module  
24                  state and the module refill state is triggered by a drop in the material below the fluid  
25                  level sensor.